Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Must-Knows: Unit 2 (Macroevolution)**

Mrs. Krouse, AP Biology, 2015-2016

**Test Format:** 15 multiple choice questions, 1 short answer question (in this question, you also have to calculate standard error and 95% confidence limits for two sets of data and interpret your results)

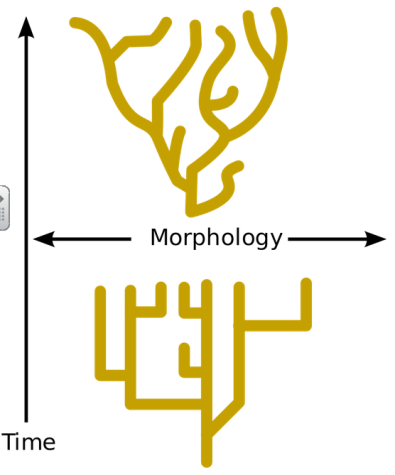
**Topic #1: Macroevolution and Speciation**

1. Describe the difference between prezygotic and postzygotic barriers to reproduction between two populations.
2. Provide an example of a prezygotic barrier.
3. Provide an example of a postzygotic barrier.
4. Two populations of protists were raised on two different food sources—glucose (Population #1) and lactose (Population #2). Each population adapted to its food source. When members of the two populations were put in the same petri dish, scientists recorded the number of successful matings within and between members of the two populations.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Female | | |
| Male |  | Population 1 | Population 2 |
| Population 1 | 26 | 11 |
| Population 2 | 9 | 30 |

Are the populations two different species? How do you know?

1. If two populations of giraffe can mate and produce living offspring but the offspring are sterile (i.e. infertile or unable to reproduce), are the two populations members of the same species? Why or why not?
2. Identify the model for the rate of evolution—gradualism vs. punctuated equilibrium—shown by each graph to the right. Explain your choices.



1. Several populations of the same ancestral species of river turtle spread out to different rivers and adapted to each new environment. Over time, the members of the different population became unable to mate successfully with one another. Is this an example of divergent evolution, convergent evolution, or coevolution? Explain your answer.
2. Lizards and salamanders are not closely related. Lizards descend from ancestral reptiles, and salamanders descend from ancestral amphibians. Because they live in similar environments, however they have adapted similar body forms (ex: four limbs and a tail). Is this an example of divergent evolution, convergent evolution, or coevolution? Explain your answer.
3. The old world swallowtail (Papilio machaon) caterpillar lives on the fringed rue (Ruta chalepensis) plant. The rue produces oils that repel plant-eating insects. The old world swallowtail caterpillar developed resistance to these poisonous substances. Is this an example of divergent evolution, convergent evolution, or coevolution? Explain your answer.

**Topic #2: Classification and Biodiversity**

10. On the phylogenetic tree shown to the right, what happened to species V?

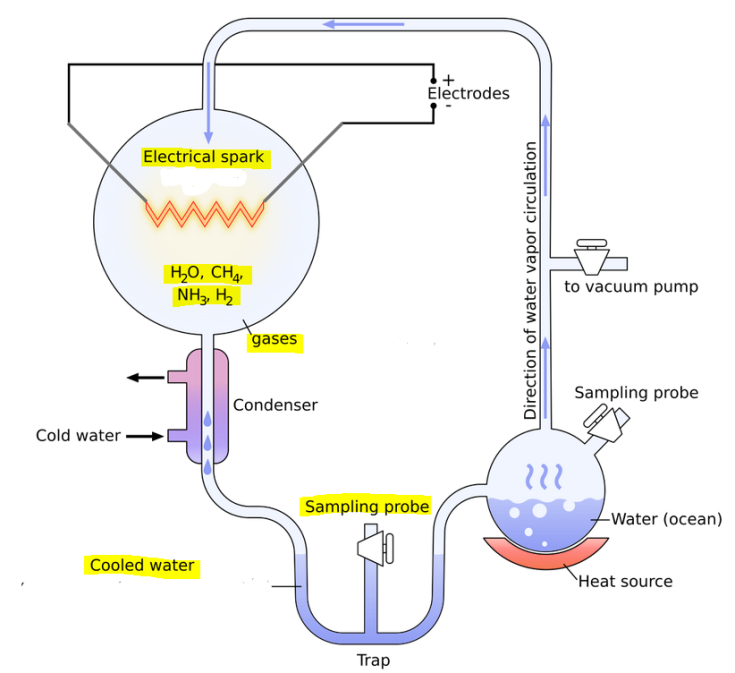
11. On the phylogenetic tree shown to the right, among species X,Y, and Z, which two species share the most recent common ancestor? How do you know?

12. Describe three traits found in the universal common ancestor of the three domains of life—Archaea, Bacteria, and Eukarya. (Note: These traits are also found in current members of the three domains of life.)

13. Use the table of shared morphological characteristics for the four species—*Spermocyon, Castropsis, Pseudofelis, and Neomysticena*—to create a cladogram in the space below showing the evolutionary relationships for these four species. Your cladogram should include “tick marks” to represent the traits.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Character | *Spermocyon* | *Castropsis* | *Pseudofelis* | *Neomysticena* |
| 3 toes on hindfeet | X | X |  | X |
| Naked tail (hairless) | X | X | X | X |
| Incisors greatly enlarged |  | X |  | X |
| Hair tufts protrude from ears |  |  |  | X |

**Topic #3: Origin of Life**



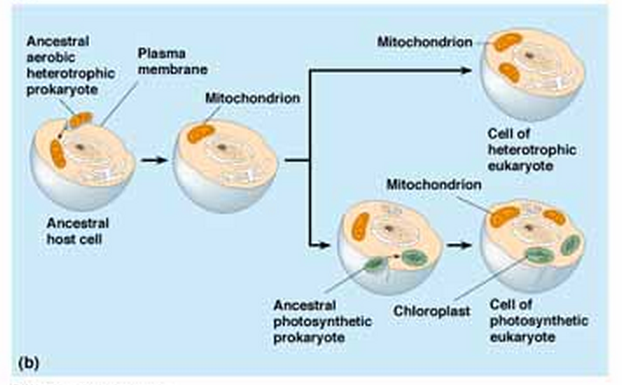
14. The image to the right shows Miller and Urey’s apparatus for their origin of life experiment.

A) What did the gases in the large round chamber represent?

B) What did the electrical spark represent?

C) What did Miller and Urey find using the sampling probe in the cooled water at the bottom of the apparatus? What conclusion did they draw from their results?

15. Which molecule—DNA or RNA—have scientists concluded was the first molecule of inheritance? How did they conclude this?

16. What process is shown in the picture below? How does this relate to the origin of eukaryotic cells? Which cell part—chloroplast or mitochondrion—appears to have evolved first, and how do you know?

17. What are two features of mitochondria and chloroplasts that suggest they were once free-living prokaryotic cells?

18. Identify 3-5 major steps in the history of life that led from the synthesis of the first simple organic molecules (ex: amino acids) to the origin of the first multicellular organisms with cells specialized for particular functions?

**Review for the Short Answer Question**

19. The chart below shows the percentage of successful matings between members of a population of butterflies (called Population A) in five trials and the percentage of successful matings between members of Population A and another population of butterflies with a similar appearance, Population B. Remember, a successful mating is defined as a mating that produces viable, fertile offspring.

When observed in nature, members of Population A do mate with members of Population B, and the resulting offspring are both viable and fertile. However, later hybrid generations show reduced survival and reproduction rates.

A) In the chart below, the mean and standard deviations for each set of data are given. Calculate the standard error of the mean (SEM) and 95% confidence limit for each set of data. Record your work and answers in the chart.

*(Note: SEM represents the Standard Error of the Mean. “s” represents the standard deviation, and “n” represents the number of data points.)*

95% Confidence Limit = mean ± 2SEM

*(Note: the 95% confidence limit will be a range of values. If we used the 95% confidence limit to plot error bars around the means for each data set, the mean + 2SEM would represent the top of the error bar, or in other words, the error bar upper limit. If we used the 95% confidence limit to plot error bars around the means for each data set, the mean – 2SEM would represent the bottom of the error bar, or in other words, the error bar lower limit.)*

|  |  |  |
| --- | --- | --- |
| **Trials** | **% of Successful Matings between Members of Population A** | **% of Successful Matings between Members of Population A and Population B** |
| 1 | 93 | 71 |
| 2 | 97 | 63 |
| 3 | 92 | 76 |
| 4 | 91 | 70 |
| 5 | 90 | 66 |
| Mean | 92.6 | 69.2 |
| Standard Deviation (s) | 2.70 | 4.97 |
| Standard Error of the Mean  (show your work and round to the nearest hundredth) |  |  |
| 95% Confidence Limit  (Show your work, round to the nearest hundredth, and record a range of values like 4.32-5.55) |  |  |

B) Compare the 95% Confidence Limit for both sets of data. State whether they overlap and explain what this means.

C) Identify the specific type of isolating mechanism that is preventing successful matings between members of Populations A and B. State whether this is a prezygotic or postzygotic isolating mechanism and justify your claim using information from the prompt.